3

The Epidemiologic Transition and Health Priorities

José Luis Bobadilla, Julio Frenk, Rafael Lozano,
Tomas Frejka, and Claudio Stern

The world approaches the end of a century and a millennium having achieved, during the last century, the most intensive and extensive health changes in history. Advances in our knowledge of the causes and effects of diseases, progress in sanitation and nutrition, development of vaccines and drugs, expansion of a vast network of facilities and personnel, appearance of a whole sector of the economy devoted to health-related goods and services, predominance of medical over religious or legal considerations in the interpretation of human experience: these are but a few of the shifts that have radically transformed the health scene in most countries.

The results are well known: more people enjoy the benefits of good health than ever before. Yet, as with all true progress, improvement in health has created new problems and challenges. In a very real sense, it can be said that the health field has been a victim of its own successes. Thus, the dramatic reduction in the incidence and severity of infectious diseases has allowed the survival of a large number of individuals who, for that very reason, become increasingly exposed to the risk of chronic ailments and injuries. Similarly, control of fertility is modifying structure of the population, leading to an unprecedented proportion and quantity of elderly people, who pose enormous demands on the health care system.

In addition, the general process of industrialization, urbanization, and modernization—of which the expansion in health services has been both a consequence and a facilitator—has entailed high costs. The environment has been seriously and permanently damaged in many parts of the world. We have learned that mass consumption of tobacco is directly responsible for a large burden of premature deaths and disabilities. The shift in diet from vegetables and cereals to animal foodstuffs and some artificial products has been recognized as contributing to cardiovascular disease and some cancers of the digestive system.

The net result of these changes has been that the health field has achieved a level of complexity never seen before. Such complexity is compounded by the fact that the benefits of progress have been very unequally distributed both between and within nations. Together with the explosion in science and technology there has been a widening of the gap between what is achievable by current knowledge and what is actually achieved. To the extent that controlling certain diseases becomes technically feasible, their continuing existence among deprived populations becomes morally compelling. The problem of equity has thus emerged as one of the central concerns of our times.

As part of the increasing complexity of the health field, most governments around the world have developed various forms of organized social response to the problems of their populations. Although the role of the state in providing health services has recently decreased in some countries, the overall trend after World War II has been oriented toward an incremental participation. Modern nations, on the whole, now consider health an essential element of development, requiring integration into national plans.

The simultaneous presence of more complex health conditions, on the one hand, and increased commitment to extending health services, on the other, has given a strategic character to the definition of priorities. This is compounded, in many countries, by a situation of stagnant and even shrinking resources. In such a context, it has become imperative to develop methods for long-term health planning that are solidly grounded on demographic and epidemiologic information. Needless to say, many economic and political variables outside the planning process affect the final allocation of resources. At the very least, health planning allows us to know the way in which those other variables make resource allocation deviate from the technically defined optimum. At its best, health planning can constitute a force for mobilizing social resources toward the satisfaction of health needs.

Indeed, our ability to identify new health changes and opportunely respond to them depends on a clear understanding of the determining factors and on the consequent design of innovative models for health promotion, and for disease prevention and treatment. In this chapter we attempt to apply the theory of the epidemiologic transition to explain the recent transformations and the future evolution of health needs in populations. We particularly refer to middle-income countries, where such transition adopts specific forms and where the gap between the changing character of health problems and the

adequacy of the social response is of significant concern. Among the middle-income countries, Mexico is used to illustrate the basic information and methods required to incorporate demographic and epidemiologic criteria into the process of planning for health services and related programs.

The opening section of the chapter presents the conceptual basis for understanding the epidemiologic transition in middle-income countries and the main components of health planning. In it we define demographic variables as important measures of population health needs and therefore as fundamental elements for setting priorities. Next, we describe some of the important social and demographic changes which have occurred in Mexico during the past fifty years. An account of the main aspects of the epidemiologic transition in Mexico follows, in which we propose that it might be a new model not hitherto considered by the original theory. The following section presents projections of the most important demographic and epidemiologic variables from 1980 to 2010 and the general trends of social variables in that time period. The last section includes an analysis of the likely implications that the main described changes will have on the health system, and we suggest some reforms that should be introduced to deal with the complex health scenario of the next twenty years.

Conceptual Framework

Although some authors may consider it possible to identify a common pattern of epidemiologic transition for the industrial nations, for the so-called developing countries this is almost impossible without incurring significant mistakes or superficial generalizations. Actually, not all poor countries are continuously in the process of developing; at times of crisis they seem to be static or even underdeveloping. In many respects, the differences among poor countries are often greater than those between industrial and developing nations. The picture is even more complex in the areas of health and health care, since many relatively poor countries resemble industrial nations in these respects (as is true of Costa Rica, Cuba, and Sri Lanka). However, most countries rich and poor present serious inequalities among different social groups, leading to internal heterogeneity. Many rich nations are characterized by development with pockets of underdevelopment; conversely, most of the developing nations are composed in varying proportions of underdevelopment with pockets of development.

Attempting to describe the health transition for the developing countries as a whole is thus inappropriate. In the absence of an optimal classification of countries, we will adopt the one used by the World Bank, based on national income per capita. In particular we will refer to "middle-income" countries, which in 1990 had a median gross national product per capita between US$611 and US$7,619 (World Bank 1992).

The Health Transition

Our analysis of the dynamics of health in human populations begins with the differentiation of two basic elements. On the one hand, there are the *health conditions* or needs of the population; these are represented mostly by negative deviations from physical and psychological function, although they also include nonmorbid conditions like pregnancy and, in the most comprehensive perspective, positive well-being. On the other hand, there is the *organized social response* to the health needs of the population; this entails any organized collective action aimed at promoting health, or at preventing and treating disease. In this context, the *health transition* refers to the changes over time of both the health conditions and the organized social response. In turn, the health transition comprises two sets of processes, corresponding to the foregoing differentiation. The first one is what Omran (1971) described as the *epidemiologic transition*, that is, changes in health conditions. The second is the *health care transition*, that is, changes in the organized social response (Frenk and others 1989b). Empirical evidence shows that these two transitions are dependent on each other. For example, universal coverage of effective health services has contributed to the decline of childhood mortality due to infectious diseases in countries like China, Costa Rica and Sri Lanka. What is less common is the anticipatory adaptation of the health system to ongoing changes in the health needs of the population. In any case, we have a more elaborate theory of the epidemiologic than of the health care transition.

The theory of the epidemiologic transition as developed to date refers to the changes in the population parameters and in the health and disease patterns, which occur over decades or centuries. The elements of this theory are: (a) the description of the strong links between demographic changes and health needs of populations, as measured by the mix of causes of death and the age structure of mortality; (b) the coherent classification of eras that allows for the identification of important socioeconomic changes that affect survival at different times; and (c) the potential for anticipating changes in disease patterns and the opportunities offered by such anticipation to strategic health planning.

In his original formulation, Omran (1971) proposed three eras of the epidemiologic transition that countries experience at different stages of their social and economic development:

The era of *pestilence and famine*, when life expectancy is low (20 to 39 years) and the major causes of death are associated with malnutrition, infection, and complications of reproduction.

The era of *receding pandemics*, when the disease pattern is still dominated by infectious diseases and malnutrition, but major mortality fluctuations, including peaks, are less common. Life expectancy rises to between 30 and 50 years, and there is a tendency for increasing control of the biological pollution of the environment, as a result of improved sanitation, with declining rates of infection.

The era of *degenerative and man-made diseases*, characterized by the rise of cardiovascular diseases, cancer, diabetes, and other degenerative diseases. Life expectancy is over 50 years and fertility becomes a crucial factor of population growth.

The original description of the theory and some of the later updates acknowledge the heterogeneity of social and eco-

nomic development among countries. Accordingly, Omran (1971) suggested that at least three models can be recognized: the classical or Western model, the accelerated model (such as that followed by Japan), and the delayed or contemporary model, the main differences among them being the timing and the pace of change. The delayed (or contemporary) model described the incomplete transition of most developing countries. The important decline of mortality started after World War II and was mainly a result of the adoption of imported public health measures and some medical interventions, and not so much to improvements in economic and social factors, as was the case in the classical or Western model. Although the gains in child survival have been substantial in this model, the mortality rates are still relatively high.

More recently, Frenk and others (1989b) have proposed a new model, called the "protracted-polarized model" of the epidemiologic transition. Its formulation is largely based on observations from some large middle-income countries. Its main features are as follows:

- The decline of mortality takes place in very short periods of time, as compared with the classical model. Western European countries that followed the classical model took more than 130 years to reduce mortality from 35 deaths per 1000 population to 10, whereas many middle-income countries have achieved a similar decline in less than 70 years.
- The onset of the mortality decline starts in the twentieth century, reaching low levels near the end of the century.
- Despite significant reductions in mortality by infectious diseases, these diseases are not brought fully under control, and their incidence rates remain relatively high by the end of the century. This situation, together with the increase of noncommunicable diseases, produces an *overlap of eras.*
- The unequal distribution of wealth and the incomplete coverage of interventions gives place to a widening of the gap in health status among social classes and geographical regions. This process has been described as "epidemiologic polarization" (Frenk and others 1989a). Even though this process might have occurred under other transition models, in the protracted model polarization possibly goes on for longer periods.
- A review of morbidity data reveals the reemergence of epidemic diseases that had been controlled or eradicated, which produces a *countertransition.*

The first two characteristics of this model serve to differentiate it from others previously described. The other features have not been examined for countries presenting the classical or the delayed model. It is proposed that they also might differ between the protracted-polarized and the other models of epidemiologic transition.

There are two implicit assumptions in transition theory that need to be critically examined. One is that each era is more desirable than the previous ones because it reflects "progress." Yet, even when survivorship increases, morbidity and disability do not necessarily decline in the same proportion; and actually the health conditions for a large proportion of adults might not improve or might even worsen (Wildavsky 1977). It could be that the third era represents an advanced stage of a longer transitional era, so that in a fourth era it might be possible to live in societies with low mortality and morbidity rates of both infectious and noncommunicable diseases and of accidents, violence, and mental diseases.

The second assumption refers to the sequence of the transition from one era to the other. It has been proposed that some modifications to the original theory might be introduced to accommodate experiences from some middle-income countries (Frenk and others 1989b). First, the eras are not necessarily sequential, since two or more may overlap at the same time. Second, the evolutionary changes in the pattern of morbidity and mortality are reversible, so that there can be backward movements, as we pointed out earlier.

In addition, the theory presents some limitations that need to be highlighted:

- It has limited potential to explain heterogeneity in disease patterns within countries. As we postulated previously, within a given country, it is possible to recognize social groups with common infectious diseases, coexisting with social groups affected by noncommunicable diseases.
- The implicit and operational concept of health is exclusively limited to health losses that can be documented through mortality. Several health problems that predominantly produce morbidity, let alone positive aspects of health, are by definition ignored. This is extremely important, since the advance in therapeutics often postpones or averts death but does not cure the disease.
- The capacity to relate social and economic changes to health improvements is relevant only to the general aspects of development. Unfortunately, the theory as it stands cannot explain how social and economic changes are related to health transformations; it also has a limited value to explain the role of different forms of social organization on the timing, pace, and modality of the epidemiologic transition.

Health Planning: Using the Transition to Set Priorities

As experience in the developing countries accumulates and as new analyses are elaborated, our knowledge will expand and the progression of epidemiologic transition theory may help us to understand current health dynamics in a variety of countries. Such understanding is essential not only to advance our theories about the nature of change in the health field but also to shape future reforms.

With respect to budgetary allocations, there are two main methods of planning for health services. The first one, which is the most commonly used, can be called the retrospective method, because it commonly starts out from a fixed budget and then moves to the allocation of those resources to different health programs, according to previously established priorities.

The alternative method, which can be called prospective, begins with a definition of population health needs. In this

context, the term "needs" refers specifically to health conditions that require care but not to the care itself (Donabedian 1973). That is to say, needs can be defined as health and disease processes, such as death, disease, and disability, as well as nonpathological conditions that require care, such as pregnancy or the monitoring of childhood growth and development. The two most important demographic determinants of health needs in a population are the absolute number of individuals and the age composition (Jones 1975). Other important determinants include changes in the prevalence rates of disease, injury, and disability, as well as changes in the demand for health services, which are influenced by rising expectations and disposable income.

From these needs, the planning process moves on to determine the health services that would be required to meet them. Finally, service production targets are used to estimate the required resources, including human and material, as well as their financial expression in a budget. The translation of health needs into their service and resource equivalents is achieved through a series of mediating factors. Thus, the satisfaction of health needs by the use of services is mediated by the quality, technological content, and equity in the distribution of those services. In turn, the amount of services that are actually produced and used is determined by the availability, accessibility, and productivity of resources. The planning process makes use of both normatively and empirically derived standards that provide the quantitative elements required to translate needs into services and into resources (Donabedian 1973; Frenk and others 1988). The retrospective approach to health planning has the undeniable advantage of establishing, from the outset, the budgetary limitations that the planner unavoidably has to face. Its major disadvantage, especially for long-term planning, is that it tends to perpetuate existing conditions. Therefore, if the purpose of planning is to anticipate the future in order to transform it, it must adopt a prospective view that begins by estimating future health needs and derives from them the resource requirements. In this respect, the theory of the epidemiologic transition provides an invaluable framework for projecting likely scenarios of health needs. Such an anticipatory exercise is the only rational way to determine health priorities for the long run.

For these reasons, the present chapter adopts a prospective approach in illustrating the nature of the health transition in Mexico. We use the most straightforward measures of health needs, namely, population size and mortality. All our calculations and projections to the year 2010 are based on age- and cause-specific mortality rates, in combination with projections of population age groups. From this point of departure, we analyze the changes that must be introduced if the health care system is to respond in an effective manner to an increasingly complex set of population needs.

Mexico: Historic Trends

Mexico has experienced a significant process of social and economic change during the last fifty years, yielding considerable improvements in the living conditions of the population (table 3-1). This process has been causally associated with the demographic and epidemiologic transitions. These are dealt with below in terms of Mexico's social, demographic, and health care variables.

Socioeconomic Factors

From a predominantly rural and agrarian country, Mexico has moved a long way toward becoming an urban and industrial nation. Although economic growth in Mexico during this period was substantial until the early 1980s (when the financial crisis and economic stagnation began), various factors have contributed to maintain a highly unequal social and economic structure.

Among the factors which have contributed to this high degree of social and economic inequality among the Mexican population, the following are important: mountainous land, populated since ancestral times by a large number of different ethnic groups; three centuries of colonial rule during which a racially based unequal social structure was institutionalized; a model of capital-intensive industrial development during the last fifty years (which is not easily compatible with greater social equality, since it benefits the urban upper- and middle-class groups to a much greater extent than the rural population and the urban working classes); a very fast rate of population growth since the 1940s, demanding large resources for basic social and economic infrastructure (also very unequally distributed, owing to the other reasons given); political centralization and uninterrupted management for the last seventy years by the same political party.

As a result of some of these factors, territorial, economic, and social "development" has taken place in a highly concentrated manner. Industrialization and urbanization are highly concentrated and coexist with rural dispersion and extended traditional agrarian forms of production and subsistence. Distribution of income is among the most unequal in the world. Differences in living standards are vast. A few have much more than they need (the top 10 percent of the population concentrate about 40 percent of national income), whereas a large proportion of the population subsists at substandard levels in every respect, including, of course, health (López-Gallardo 1984).

Thus, Mexico has undoubtedly experienced a process of economic growth, and important changes in its economic and social structure have been taking place. The labor force working in agriculture decreased from 65 to 23 percent between 1940 and 1990 (see table 3-1); the urban population increased from 20 to 57 percent between 1940 and 1990; the literate population increased from 43 to 88 percent between 1940 and 1990; houses with running water increased from 17 percent in 1950 to 79 percent in 1990; and so forth. But great inequalities not only persist; they have become aggravated as a result of the financial and economic crisis prevailing in the 1980s. Income and wealth have become even more unequally concentrated; unemployment and underemployment are on the rise, and there are fewer public resources to mitigate poverty and extend the economic infrastructure and social services to the whole

Table 3-1. Indicators of Social and Economic Development in Mexico: 1940–90

Indicators	*1940*	*1950*	*1960*	*1970*	*1980*	*1990*
Labor force in agriculture (percent of economically active population)	65.4	50.2	49.4[a]	39.2	25.8	22.6
Literate (percent of population aged 15 and over)	43.2	55.9	65.5	74.1	82.7	87.6
Percent of urban population[b]	20.0	28.0	36.5	44.9	51.8	57.4
Percent of rural population[c]	70.0	56.7	48.3	40.4	33.7	28.7
Percent of houses with running water	—	17.0	23.4	61.4	70.2	79.4
Percent of houses with sewer	—	—	29.7	41.0	51.2	63.6
Percent of houses with one room	—	60.4	57.8	39.8	29.8	—
Occupants per house (average number of persons)	—	4.9	5.5	5.8	5.5	5.0
Gross domestic product per capita (in 1980 U.S. dollars)[d]	—	1,408	1,547	2,180	3,096	2,708

— Data not available.
a. Estimated from Altimir, 1974.
b. Localities with more than 15,000 inhabitants.
c. Localities with less than 2,500 inhabitants.
d. Data from Gómez-de-Léon and Frenk, 1992.
Source: Generally, 1940–80: United Nations, 1989a; 1990: México, Instituto Nacional de Estadística, Geografía, e Informática (INEGI), 1992. Exceptions indicated above.

population (Consejo Consultivo del Programa Nacional de Solidaridad, 1990).

Historic Trends in Population and Health

During most of the twentieth century Mexico was a typical example of a country with high levels of fertility and declining mortality, a situation that resulted in one of the highest rates of population growth in the world. In the decades of the 1950s, 1960s, and 1970s, the annual population growth rate for Mexico was over 3 percent. Figure 3-1 depicts the trends of the birth and mortality rates during the twentieth century.

Until 1970 the rate of population growth was one of the most important determinants of health needs. Two out of the other three primary demographic indicators relevant for health planning remained fairly constant: the age structure of the population during the period 1950 to 1980 showed a pyramidal form, with 43 to 47 percent of the inhabitants under fifteen years of age, and the absolute number of deaths was similar in 1950 to that of 1980, about 450,000.The number of births was the exception: it increased by 74 percent from 1950 to 1970 (table 3-2).

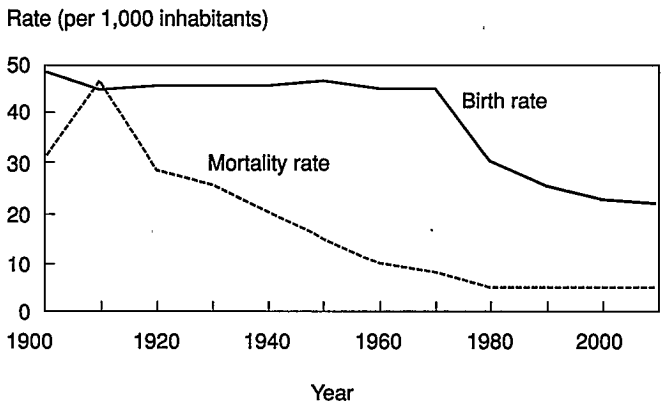
During these three decades the rate of economic growth was higher than that of the population (Wilkie 1978). Similarly, health services expanded both in scope and coverage, at a rate faster than the population.

The intervention of the Mexican state in the provision of health services was institutionalized and strengthened as early as the 1940s. A social security system and the Ministry of Health were created (Frenk, Hernández-Llamas, and Alvarez-Klein 1980). Health was seen as an essential input to economic development. The social security system, which has become the dominant scheme for the provision of medical care, is limited to those who are formally employed, especially those in the industrial and service sectors. In 1990 it covered about 55 percent of the population of Mexico.

During the postwar period in Mexico, health indicators tended to improve. Infectious diseases were displaced as the main causes of death, and the infant mortality rate in 1991 is estimated to have declined to less than a third of its level in 1950. The increase of deaths due to noncommunicable diseases was detected before 1950, but it was not until the late 1960s that substantial increments began (table 3-2). The sharp increase of noncommunicable diseases between 1970 and 1980 is overestimated. A large proportion can be explained by the improvement in the certification of cause of death during the decade of the 1970s, and the expansion of health facilities with more accurate diagnostic technologies.

In the decades of reference, 1950 to 1980, estimates of the population size and of the numbers of births were quite sufficient to anticipate the load of morbidity, injury, and disability to be carried by the health services in any subsequent ten or fifteen years. There was less need for strategic planning, for several reasons, than at present. The rate of economic growth

Figure 3-1. Death and Birth Rates in Mexico, 1900–2010



Note: Actual data 1900-80; estimates 1990-2010.
Source: 1900-1970: Alba 1971; 1980: México, INEGI 1984; 1990-2010; México, INEGI y CONAPO 1985; 1990-2010: Instituto Nacional de Estadistica 1986.

was faster than that of the population, so that maintaining at least a constant level of coverage and quality was taken for granted. Table 3-2 presents in the bottom row the growth rate in gross domestic product for three decades, showing a steep increase from the 1950s to the 1970s. In sharp contrast, the trend is reversed during the 1980s, when the same indicator yields an average of 1 per cent for the decade 1981–90. Although economic growth rates have recovered somewhat over the first two years of the 1990s, most projections anticipate lower growth rates for the period 1993–96, than those reached in the 1970s.

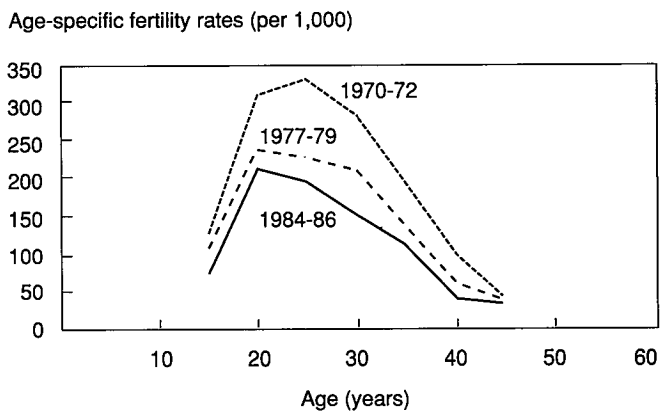
A significant demographic change of the 1970s was the onset of a rapid fertility decline. The total fertility rate declined from 6.7 (children per fertile age woman) in 1970 to 5.7 in 1975–76 and to 4.3 by 1981. For 1990 the total fertility rate was estimated at 3.3 children for every woman of child-bearing age. This fertility decline is expected to continue, although at a slower pace, for the foreseeable future. Figure 3-2 shows the age-specific fertility rates (per 1,000 fertile women) in three different periods between 1970 and 1986, when significant decline in fertility occurred.

The Epidemiologic Transition in Mexico

The changes in the patterns of morbidity and mortality, which are closely related to the demographic transition, constitute the main elements of the epidemiologic transition (Omran 1971). It is suggested that Mexico might be undergoing an epidemiologic transition under the protracted-polarized model (Frenk and others 1989b) described earlier, characterized by infectious diseases and malnutrition coexistent with noncommunicable diseases and injury.

Mortality in Mexico started to decline early in the twentieth century. At the beginning of the century, life expectancy at birth was estimated to be about twenty-five years. By 1950, life expectancy had almost doubled. For 1950, estimates of life expectancy range from 46.2 to 49.1 years for men and 49.0 to

Figure 3-2. Age-Specific Fertility Rates in Mexico during Period of Fertility Decline



Source: Aparicio-Jiménez 1988.

Table 3-2. Selected Demographic, Epidemiologic, and Economic Measures for Mexico, 1950–2010

Measures	*1950*	*1960*	*1970*	*1980*	*1990*	*2000*	*2010*
Demographic							
Population (thousands)	27,376	37,073	51,176	69,655	81,250	103,996	123,158
Annual population growth rate (over previous ten years)	—	3.0	3.2	3.1	2.6	1.9	1.7
Age groups (percentage)							
0–14	43	46	47	44	38	31	29
15–64	54	51	50	53	57	64	65
65 and over	3	3	3	3	4	5	6
Deaths (thousands)	443	419	499	462	423	535	665
Births (thousands)	1.278	1.663	2.224	2.100	2.352	2.520	2.745
Epidemiologic: cause of death							
Infectious and parasitic diseases							
thousands	214	158	196	83	66	50	41
percentage	48.4	37.6	39.2	17.6	15.6	9.3	6.1
Cardiovascular diseases, cancer, diabetes, other selected chronic diseases, and violent deaths							
thousands	66	77	111	217	229	388	526
percentage	15.0	18.3	22.3	46.9	54.3	72.6	79.4
Economic							
GDP annual growth rate per capita (over previous ten years)	—	3.0	3.7	5.5	1.0	—	—

— Data not available.

Note: Projections for years 2000 and 2010.

Source: Demographic measures 1950–80: United Nations 1986; 1990: México, Instituto Nacional de Estadística, Geografía e Informática, 1992. Demographic projections: México, Instituto Nacional de Estadística, Geografía, e Informática y Consejo Nacional de Población 1985. Epidemiologic measures, 1950–90: México, Dirección General de Estadística, from vital statistics of the Civil Registrar for 1950, 1960, 1980, and 1990 (unpublished); 2000–2010: Expert opinion on linear trends 1950–80; 1960–80: Economic Commission for Latin America and the Caribbean 1986; 1990: World Bank 1992.

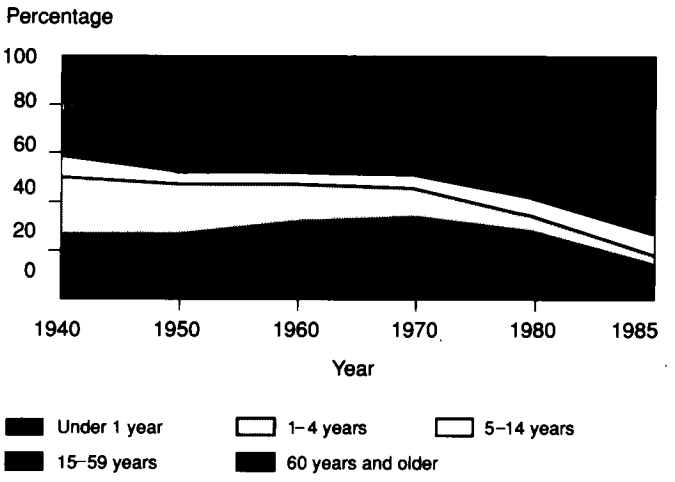
52.1 for women (Camposortega 1988). The mortality decline has continued since then, and by 1990, life expectancy was estimated at about seventy years (World Bank 1992).

According to the original theory proposed by Omran (1971), and judged solely by the time of onset and the rapid speed of the mortality decline, Mexico would fit in the accelerated model. The common denominator of the delayed model and its transitional variant (Omran 1983) is the starting point of the pronounced decline in death rates in the decade of the 1950s. Clearly the decline of mortality in Mexico started earlier, in the 1920s. For this reason Mexico does not fit the delayed model nor its transitional variant.

One of the universal characteristics of the epidemiologic transition is the shift of the age structure of mortality from the young ages to the old ages. Figure 3-3 presents the age distribution of deaths in Mexico for the period 1940–85. It is interesting that the greatest changes in the age structure of mortality occur between 1970 and 1985. Similar to what Omran (1983) described for the transitional variant of the delayed model, the reductions in infant and child mortality (birth through four years) in Mexico are substantial, but the levels slacken at relatively high rates. For the period 1981–86 the infant mortality rate was 43 deaths per 1,000 live births (Bobadilla and Langer 1990), representing about 20 percent of the total deaths (figure 3-3). It is likely that the low percentage of infant deaths in 1940 is affected by heavy underregistration. The percentage of total deaths which correspond to the elderly (over sixty years) increases from 18 percent in 1940 to almost 40 percent in 1985. The latest information on mortality shows that 50 percent of all registered deaths in 1990 occurred among the elderly.

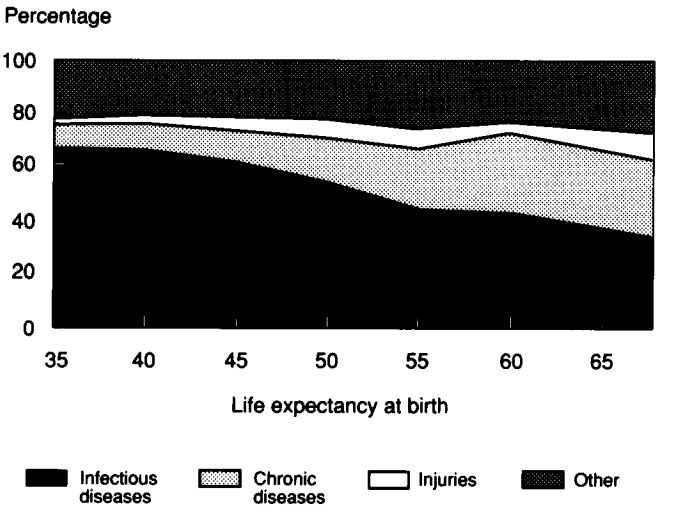
As life expectancy at birth increases, the structure of mortality by causes of death changes (Omran 1971). The general

Figure 3-3. Deaths in Mexico by Age, 1940–85



Source: México: Secretaría de Salud 1987.

Figure 3-4. Deaths by Cause, According to Life Expectancy at Birth



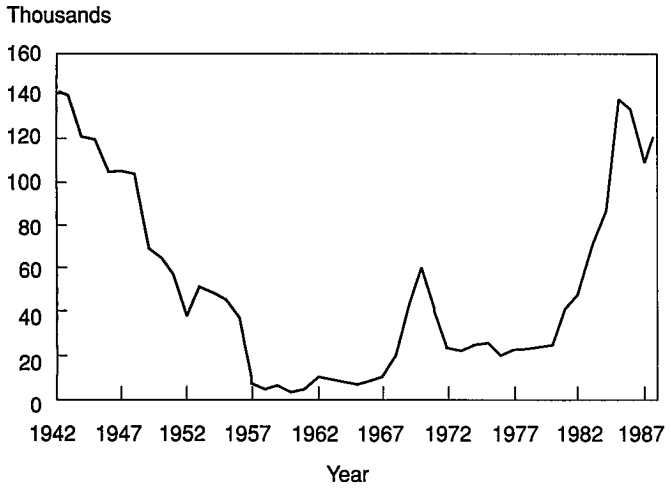
Source: México; INEGI 1986.

trend is as would be expected: as life expectancy rises, the proportion of infectious diseases declines and the proportion of noncommunicable diseases rises. Figure 3-4 depicts, at different levels of life expectancy, the relative distribution of deaths by cause of death. It is interesting that, due to the young age structure of the Mexican population, at the highest level of life expectancy shown (sixty-eight years) the proportion of infectious disease is still high (representing about 35 percent of the deaths).

Improvements in living conditions reduced the incidence rates of diarrheal and other infectious diseases. In addition, the antimalaria and the mass vaccination campaigns contributed significantly to the decline of infections. The introduction of more effective therapy reduced the fatality rates for many infectious diseases and also contributed to the decline in the death rate.

As pointed out earlier, the trends of morbidity are not considered in the original description of the epidemiologic transition. The study of morbidity is particularly important in countries where the greater survival rates have been obtained through reductions of lethality, sometimes in the absence of reductions of incidence rates. In Mexico many infectious diseases that have very low rates of mortality still present high rates of incidence or prevalence. Two groups can be distinguished according to their trends: first, the diseases preventable through vaccination—such as measles, poliomyelitis, and diphtheria—that are clearly declining; second, diseases that have been previously controlled, such as malaria, dengue fever, and cholera, but have recently shown a reemergence (Soberón and others 1988). Figure 3-5 shows the trends of the absolute number of newly diagnosed malaria cases in Mexico for the period 1942–87. In the early 1940s there were more than 140,000 cases per year. This figure declined to less thus 5,000 in the early 1960s, but then started to increase, so that by 1985

Figure 3-5. Incidence of Malaria in Mexico, 1942–88



Source: México: Dirección General de Epidemiología 1989.

there were more than 130,000 cases. This is a typical example of the process called countertransition mentioned earlier.

The overlap of eras is closely related to the pace of the epidemiologic transition among different social groups. The universal social inequalities in health have been usually described in quantitative terms, because the burden of disease and death is greater among the poor. The mortality decline starts among the higher social classes, and eventually the lower classes catch up and close the gap. This is described as a general pattern of transition (Omran 1983) and is probably applicable to all countries regardless of the model of epidemiologic transition they pass through. Under the protracted model, however, the lower social classes show very small improvements, which raises questions about the time required to catch up with the upper classes. Thus the period of polarization seen in other models probably takes longer in the protracted model. Table 3-3 shows the gap between the infant mortality rate in the poorest states of Mexico, those of the southern region, and that of the wealthier states in the northern region of the Mexican territory. It is shown that the excess of mortality in the poorer states rises from 1.6 to 3.3, as compared with the wealthier states.

The different patterns of epidemiologic change within the country provide further evidence of the epidemiologic polarization in Mexico. In table 3-4 we compare the cause-specific death rates for diarrheal diseases and acute respiratory infections with those for cardiovascular diseases and cancer. The death rate for diarrheal diseases and acute respiratory infections was 1.6 times higher in the southern region in 1940, whereas in 1985 it was almost four times higher in the southern region than in the northern. Both regions show an impressive absolute decline, but the greatest occurred in the northern region, where the corresponding death rate was reduced by 94 percent from 554 (deaths per 100,000 population) in 1940 to 31 in 1985. In the southern region the rate was reduced by 86 percent during the same period, from 878 to 122.

The trend of the death rates due to the selected chronic diseases shows very little change for the northern region, with an increase of 25 percent, whereas in the southern region the increase was about 85 percent. This discrepancy in the rate of increase of chronic diseases leads to a convergence of the corresponding rates in both regions (table 3-4). It can be concluded from table 3-4 that the inhabitants of the northern region have been able to control infectious disease and probably have entered into the third era of the epidemiologic transition. They have not, however, had the expected increase of cardiovascular diseases and cancer. The death rate for cardiovascular diseases in the United States in 1986 was 3.5 times as high as that in the northern region of Mexico.

The final outcome of this process of regional polarization is summarized in the last three rows of table 3-4. The ratio of the selected infectious to chronic diseases changes from 6.1 to 0.3 in the northern region, with the crossover occurring in the 1970s. In contrast, in the southern region the change is from 19.8 to 1.5, with no crossover by 1985. The difference in the ratios between the two regions increased from 3.2 to 5.0 in the period 1940–85.

Future Demographic, Epidemiologic, and Social Changes

In the next twenty years, many middle-income countries will continue to show substantial improvements in child health

Table 3-3. Infant Mortality Rate (IMR) in Southern and Northern Regions of Mexico, 1962–86

Period	Southern region[a]		Northern region[b]		Southern/northern
	Infant deaths	IMR[c]	Infant deaths	IMR[c]	
1962–66	39	147	26	92	1.60
1967–71	46	93	55	73	1.28
1972–76	73	112	74	69	1.62
1977–81	71	92	51	45	2.02
1982–86	66	92	32	28	3.26

a. Includes Tabasco, Yucatán, Campeche, Quintana Roo, Oaxaca, Chiapas, Puebla, and Tlaxcala.
b. Includes Baja Califoria, Baja California Sur, Sonora, Sinaloa, Nayarit, Nuevo León, and Tamaulipas.
c. IMR (Infant mortality rate) refers to deaths of children under one year of age per 1,000 live births.
Source: México, Dirección General de Planificación Familiar 1989.

Table 3-4. Cause-Specific Death Rates for Selected Infectious and Chronic Diseases in Southern and Northern Regions of Mexico, 1940–85
(per 100,000 inhabitants)

Cause of death	Region[a]	1940	1950	1960	1970	1980	1985
Diarrhea and acute respiratory infections	Southern	878	507	403	403	178	122
	Northern	554	323	227	196	66	31
	Southern/northern	1.58	1.57	1.77	2.06	2.70	3.94
Cardiovascular diseases and cancer	Southern	44	57	56	54	64	81
	Northern	91	121	110	110	112	114
	Southern/northern	0.48	0.47	0.51	0.49	0.57	0.71
Ratio (infectious/chronic)	Southern	19.8	8.8	7.2	7.5	2.8	1.5
	Northern	6.1	2.7	2.0	1.8	0.6	0.3
	Southern/northern	3.2	3.3	3.6	4.2	4.7	5.0

a. Southern region includes Tabasco, Yucatán, Campeche, Quintana Roo, Oaxaca, Chiapas, Puebla, and Tlaxcala. Northern region includes Baja California, Baja California Sur, Sonora, Sinaloa, Nayarit, Nuevo León, and Tamaulipas.
Source: 1940: México, Secretaría de Salubridad y Asistencia 1946; 1950, 1960: México, Instituto Nacional de Estadística 1980; 1970, 1980, 1985: México, Dirección General de Estadística 1973, 1984, 1988.

and life expectancy. Most of them will also witness, paradoxically, a greater burden of disease. In this section we examine the projected trends of the main determining factor of health needs and demand for health care in Mexico.

Population Projections and Future Health Needs

In the early 1980s the Mexican government (Mexico, INEGI/CONAPO, 1985) anticipated that fertility would continue to decline rather rapidly, at least through the 1980s, and probably also into the 1990s. On the basis of this assumption, a "programmatic" projection aiming for replacement-level fertility by 2010 was calculated. The actual fertility reduction of the 1980s, however, was somewhat slower, corresponding more closely to the "alternative" projection of remaining at 28 percent above replacement fertility in 2010, the projection used in this chapter. According to this projection, the annual absolute additions of population will increase, although the population growth rate will decrease from 3.1 percent in the 1970s to 1.7 percent in the period 2000–10.

The transition from high to low fertility is leading to significant changes in the age structure. The percentage of children under fifteen will decline from 44 in 1980 to 29 in 2010, whereas the absolute number will more than only increase from 30 million to 35 million. The group of adults age fifteen through sixty-four will increase from 53 to 65 percent of the population, whereas the absolute number will rise from 37 million to 80 million, more than a twofold increase. The percentage of the population age sixty-five and above will double, from 3 to 6 percent, between 1980 and 2010, and the absolute number will more than triple from 2.3 million in 1980 to 7.1 million in 2010 (table 3-2).

The aging process will entail an increase in the number of deaths, larger than any other increase in this century. By the year 2010 the total number of deaths will be 665,000, about 44 percent more than in 1980.

Despite the continuous decline in the total fertility rate, the total number of births will not decrease. The slight downward trend of the 1970s will be reversed and, according to this projection, an increase of 31 percent is expected between 1980 and 2010 (table 3-2).

Projections of the Mortality Structure by Cause of Death

In order to estimate the effect of the aging of the population on the relative contribution of the different causes of death, the 1980 age-specific death rates for eleven groups of causes of death were applied to all the age groups projected for 2010, according to the alternative projection. The results are presented in the second column of table 3-5, which shows the distribution (per thousand) of the selected causes of death. Deaths due to malignant tumors would rise from 67 to 81 per thousand. An increase can be seen in the proportion of deaths due to heart and circulatory diseases, which would rise from 169 to 204 per thousand, a 21 percent increase. The total number of deaths due to these causes would increase from 74,000 in 1980 to 136,000 in 2010, an 84 percent increase. It is interesting to note that even though the proportion of deaths caused by diarrheal diseases and acute respiratory infections would decline from 169 per thousand in 1980 to 130 in 2010, the absolute number of deaths for these two groups would increase from about 78,000 to 86,000. Planning for health services in the next thirty years cannot be done without reliable estimates of future trends in incidence rates and possible changes in fatality rates of the main diseases and injury. Projections of the future incidence rates of diseases, accidents, and violence will probably follow trends of the past twenty-five years or so. Infectious diseases will continue to decline to a certain floor, and noncommunicable diseases will continue to increase, although the pace might be less pronounced. Saturation or competition among causes will modify the increase. The same can be said for deaths due to accidents and violence.

Table 3-5. Deaths in Mexico by Main Causes, 1980 and Projections for 2010
(per thousand)

Cause of death	ICD-9 codes	1980	2010		
			Using 1980 age-specific mortality rates	*Projecting linear trend from 1965, 1970, 1981*	*Linear trends corrected by experts' opinions*
Malignant tumors	140–165, 170–175, 179–208, 230–234	67	81	89	78
Accidents and violence	E800–E848, E850–E869, E880–E888, E890–E999	161	156	287	272
Heart and circulatory diseases	390–398, 401–405, 410–438, 440–459	169	204	409	332
Chronic bronchitis and other chronic respiratory diseases	466–490, 493	32	32	6	21
Acute respiratory infections	460–465, 470–478, 480–487	82	66	0	33
Diarrheal diseases	001–009, 120–129	87	64	5	24
Cirrhosis and other liver diseases	571	35	41	52	44
Other child infections	032–037, 045–055, 138	6	5	0	1
Diabetes	250	37	48	98	80
Perinatal problems	760–779	56	32	20	16
All other causes		268	271	34	99
Total		1,000	1,000	1,000	1,000

Source: 1980: México, Secretaría de Programación y Presupuesto y Secretaría de Salubridad y Asistencia 1984; 2010: Authors' calculations.

Two different procedures were applied in estimating the relative contribution of the eleven groups of causes of death for the year 2010. First, the distribution of deaths was estimated by applying the age-specific incidence rates that would result if past trends were to continue linearly. Three points in time were used to estimate the slope and intercept of the linear trend (age- and cause-specific death rates for the years 1965, 1970, and 1981). The results, shown in the third column of table 3-5, are not plausible, as can be concluded, for example, from the virtual disappearance of deaths due to diarrheal diseases and acute respiratory infections. For this reason, we followed a second procedure. The opinions of seven epidemiologists on the future trends (previously described) of each cause of death for all age groups were used to estimate more plausible figures. The aggregated results are presented in the fourth column of table 3-5. The effect of having introduced experts' opinions is the moderation of the linear trends and the modification of straight lines into curves. The contribution of deaths due to diarrhea and acute respiratory infections is quite plausible. The same can be said for the corresponding data on accidents and violence. Deaths due to heart and cardiovascular diseases more than double their contribution, rising from 169 to 352 per 1,000 deaths. This is most likely an overestimation.

Even though the methodology to estimate the future number of deaths by specific causes could be more sophisticated and yield more plausible results, the three alternative projections shown in table 3-5 provide a guide for strategic planning. The calculations obtained using static 1980 rates give an idea of the minimum number of expected deaths in the three main causes of death (malignant tumors, heart and circulatory diseases, accidents and violence). By contrast, the results obtained by applying the regression coefficients of the linear trend provide estimates of the maximum expected contribution for the same causes of death. In other words, the first three causes of death will be responsible for 44 to 79 percent of all deaths in the year 2010. In any case, the point is made that the Mexican population in the twenty-first century will be dying from causes, most of which are preventable, that affect mainly adults and the elderly. The complexity and the costs of preventing, controlling, and treating many of the main diseases of the period 2000 to 2010 will be considerably larger than those prevailing at present. The implications of this situation for the health system will be discussed later.

Future Social Change and the Demand for Health Care

Up to this point plausible demographic and epidemiologic changes have been assumed in the estimates of health needs in the year 2010. Other economic and social changes, however, are taking place in Mexican society that will affect future health needs and that should be taken into account in health planning. In this section we briefly mention some of the trends in the areas of urbanization, education, employment, and social inequality and will speculate about their possible effects on future health needs and demands.

URBANIZATION. According to existing projections (Nuñez and Moreno 1986), by the year 2000 approximately 76 percent of the Mexican population will live in communities with 2,500 or more inhabitants. A significant part of urban growth will take place in middle-size cities (50,000 to 500,000 inhabitants), although the large metropolitan areas will also continue to grow significantly. At the same time, tens of thousands of rural localities will persist. A continued process of urbanization in a context of greater poverty will have repercussions on the incidence of diseases and disabilities related to these condi-

tions, most notably injuries, mental disorders, alcoholism, and probably drug abuse.

EMPLOYMENT. According to estimates and projections made by Trejo (1988), it will be very difficult to create formal employment in the quantity and at the pace that will be required during the next years. As was shown before, the working-age population (fifteen through sixty-four years) will grow significantly faster than the total population during the rest of the century. The annual growth rate of this population has been estimated at 3.5 percent in 1985–90, 2.7 percent in 1990–95, and 2.3 percent in 1995–2000. An average of one million jobs would have to be created yearly during the next twelve years in order to satisfy the requirements of the new population entering the labor market. The rates of economic growth required to yield so many jobs, about 6 percent annually, seem to be difficult to attain in this period. Unemployment and informal employment are likely to increase, leading to a rapid growth of population not entitled to social security. In addition, women will continue to enter the labor market at a faster rate than the general population, imposing additional pressure on the demand for jobs.

The incorporation of large numbers of people into the informal labor market will generate a much greater demand on the health subsystem for the noninsured population (that is, services provided by the Ministry of Health, other public assistance institutions, and to some extent private institutions). This, in turn, could lead to more extreme health inequities between the poor and those with formal jobs, who are entitled to social security. The increasing participation of women in the labor market could have repercussions on their health and especially on the health of their children, given the scarcity of institutionalized child care. Studies undertaken in the fast-growing assembly plants along the Mexican border with the United States are showing that children born to working women in these industries tend to have lower birth weight than those of comparable women. Also, the demand for nurseries might increase considerably.

EDUCATION. If the trend in formal education that took place in the 1970s continues, it might be expected that by the end of the century almost the whole adult population will know how to read and write, and the vast majority will have finished primary school. The average number of years of education grew from 3.5 to 5.5 years between 1970 and 1980 and to 6.2 in 1990. The average might increase to more than 9 years by the year 2010. The improvement of education and heightened exposure to mass media is likely to increase the demand for health services and for a better quality of services. It can also lead to a greater participation of the population in taking care of its own health.

SOCIAL INEQUALITY. Mexico presents one of the highest levels of wealth concentration (Hernández-Laos 1984). The degree of social mobility (access of growing sectors of the population to better jobs, salaries, and living conditions), which was a permanent characteristic of Mexican society up to the mid-1970s, will probably continue to diminish, as it did in the 1980s. As a result, it is possible to predict a greater polarization of Mexican society. The size of the middle class will be reduced, and the lower classes might again encompass 60 percent or more of the total population.

Implications for the Health Care System

From the foregoing analysis it is possible to conclude that early in the twenty-first century health needs will be governed in Mexico by an increase in the number of people who suffer from noncommunicable diseases, only moderate reductions in the absolute number of infectious diseases, and an increase in the number of births. Increasing amount and complexity in the health needs will have profound implications for the organization and delivery of health services.

Allocation of Resources for Competing Health Needs

So far, estimates of health needs have been derived only from basic information on mortality. The relation between mortality and causes of death, on the one hand, and morbidity and causes for medical care demand, on the other, is far from being straightforward. This is particularly true for countries that are in the midst of the epidemiologic transition. The discrepancy between mortality and morbidity indicators is particularly relevant for the estimation of health needs that are met through hospitalization. Often the causes for hospital admission are not represented in the main causes of death. About 65 percent of the budget for health care goes for hospital-related expenses. Thus, it is important to introduce a series of considerations into the estimates of health needs derived from mortality data.

First is the estimate of hospital use due to needs derived from reproduction and its regulation. According to hospital records, at least 40 percent of the persons hospitalized in Mexico in 1986 were women who were delivering children, either normal or with complications. This number excludes other related causes of hospital admission such as female surgical sterilization and neonatal admissions, which together might account for 3 to 6 percent of the total number of persons admitted to hospitals (Mexico, Instituto Mexicano del Seguro Social 1986).

Second is the fact that at the present time the provision of hospital services is insufficient to meet the needs of the population. Planning for future services should take into account resources required to close the gap between supply and needs. It is almost impossible to estimate the health needs to be met through hospital services using data from current information systems. The magnitude of unmet need is often a matter of speculation and debate. It is, however, possible to estimate the resource equivalents that would be required to meet the health needs derived from births, given the prevailing health care model. According to the 1987 National Health Survey (Mexico, Dirección General de Epidemiología 1988), about 30 percent of the births were not attended by a health professional, which in the Mexican context means an unmet need

of about that magnitude. Considering that the absolute number of births will increase about 30 percent from 1980 to 2010, and that 30 percent of the present deliveries are not being cared for properly, the real increase in the requirement of beds for birth care is about 85 percent (in relation to the total available). The required budget to build the hospital beds to deliver annually more than a million additional babies in the first ten years of the next century is formidable.

Third, the coexistence of noncommunicable diseases and problems related to reproduction will most likely pose a dilemma in the allocation of beds, which might not be resolved rationally. This problem can be portrayed as a competition between patients: on the one hand, pregnant or delivering women, a large proportion of whom will come from the deprived socioeconomic groups and the rural areas; on the other hand, adult and elderly patients suffering from cardiovascular disorders, cancer, diabetes, and disabilities due to accidents. There is evidence that infectious diseases and problems linked to reproduction are more prevalent in the rural areas and among the least privileged socioeconomic groups. Past experience with the decisionmaking process suggests that the outcome in the allocation of resources between the two groups will be biased toward the needs of the wealthier. Reproductive and infectious problems might become neglected health needs in the period 2000–10 if the health care model and the decisionmaking process continue as now.

Changing Priorities in the Delivery of Health Services

Probably the top priority of countries like Mexico, which are undergoing a protracted-polarized transition, is to avoid the pernicious competition among types of pathology. Yet, important segments of the health planning community—both at the national and the international levels—have themselves become polarized in two bands: those who claim that the first order of business is to bring common infections and undernutrition under control, and those who see in the rising prevalence of chronic ailments and injuries the need for a shift in priorities. Still, the complex reality of many countries means that there is no alternative but to address the pretransitional and the posttransitional problems simultaneously. Basic notions of equity demand that the gap between knowledge and action be closed for all population groups, so that the "left-over ills" (Frenk and others 1989a) represented by common infections and malnutrition cease to affect the least privileged segments of society. Eliminating the epidemiologic polarization occupies, therefore, a top place in the list of priorities.

Furthermore, there are close links between the two groups of pathology. For instance, the most common reason for heart surgery in Mexico continues to be valve replacement to repair damage produced by rheumatic heart disease—a pretransitional condition. If the relatively inexpensive preventive measures against rheumatic fever were implemented, specialized resources could be freed for the treatment of other heart conditions for which prevention is not so effective. Similarly, a large proportion of resources in the complex fields of neurology and neurosurgery continue to be used to correct preventable conditions, such as epilepsy due to birth trauma and brain cysticercosis. Addressing pretransitional pathology would reinforce the care of posttransitional diseases.

Recognizing the need to control the common infectious and reproductive problems should not lead to the conclusion that chronic diseases and injuries will have to wait their turn. Such a conclusion would most likely transform the posttransitional conditions from emerging to epidemic. To avoid this future scenario, the control of chronic diseases, especially cancer and ischemic heart disease, will require an emphasis and reliance on primary prevention programs, such as those aimed at reducing the number of individuals exposed to the risk factors or the causal agents of disease. Even wealthy countries with large investments in health care have to turn to primary prevention, as the costs of treatment and rehabilitation rapidly increase (Litvak and others 1987). Thus far, Mexico, as many other middle-income countries, has given a very low priority to such programs. The only way to reduce the demand for hospital and other specialized medical services by the year 2010 will be to implement vigorous campaigns in order to reduce the consumption of tobacco, alcohol, animal fats, sugar, and salt. The role of legislation and sanitary regulation as instruments to control the exposure to many noxious agents has not been fully exploited.

Reshaping the Health Care Model

The limitations of the health care model based on curative services in hospital settings have been clearly demonstrated in most industrial countries. No single country has been able to cope adequately with the rising costs of medical care. The health needs of the Mexican population in the foreseeable future suggest that its imported health care model could be exhausted soon. Aiming at delivering all births in hospitals is not only financially impossible but also medically unnecessary. In a similar way, performing all surgical operations in hospitals results in undue costs. The social needs of hospitalized patients will have to be met through means other than keeping them in hospitals. Many of these changes are being successfully implemented in developing countries, including Mexico, through demonstration projects. Still, changing entrenched practice patterns may take many years. Until now the health needs of the Mexican population have been growing faster than the ability to react and adapt to the new conditions. The transfer of care of some health problems from hospitals to health centers and to the homes of the affected would require a strong component of community participation. Of paramount importance is the strengthening of family and social networks to maintain the support for the disabled and the chronically ill.

Restructuring the health care model will undoubtedly require innovations. The social response to the complex health needs of the twenty-first century will have to be based on scientifically validated information. Research to design alternative modes of effectively meeting the needs of the population must be one of the key strategies of any health care system that aspires to shape the future.

Notes

We would like to acknowledge the valuable comments given to an earlier version of this chapter by Dean Jamison, Henry Mosley, Joseph Decosas, and Stephen Simons.

References

Alba, Francisco. 1971. *La Población de México: Evolución y Dilemas*. México, D. F.: El Colegio de México.

Altimir, Oscar. 1974. La medición de la población economicamente activa de México, 1950–1970. *Demografía y Economía* 8:50–83.

Aparicio-Jimenez, Ricardo. 1988. Niveles, tendencias e impacto demográfico de la anticoncepción. En: Dirección General de Planificación Familiar. *Memoria de la Reunion Sobre Avances y Perspectivas de la Investigación Social en Planificación Familiar en México*. México, D. F.: Secretaría de Salud.

Bobadilla, José Luis, and Ana Langer. 1990. "La mortalidad infantil en México: Un fenómeno en transición." *Revista Mexicana de Sociología* 1:111–32.

Camposortega, Sergio. 1988. "El nivel y la estructura de la mortalidad en México, 1940–1980." In Mario Bronfman and José Gómez de Léon, eds., *La mortalidád en México: Niveles, tendencias y determinantes*. México, D. F.: El Colegio de México.

Consejo Consultivo del Programa Nacional de Solidaridad. 1990. *El Combate a la Pobreza*. México, D. F.: El Nacional.

Donabedian, Avedis. 1973. *Aspects of Medical Care Administration*, Cambridge, Mass.: Harvard University Press.

Economic Commission for Latin America and the Caribbean. 1986. *Statistical Yearbook for Latin America and the Caribbean*. New York: United Nations.

Frenk, Julio, José Luis Bobadilla, Jaime Sepúlveda, and Malaquias López-Cervantes. 1989a. "Health Transition in Middle-Income Countries: New Challenges for Health Care." *Health Policy and Planning* 4:29–39.

Frenk, Julio, José Luis Bobadilla, Jaime Sepúlveda, Jorge Rosenthal, and Enrique Ruelas. 1988b. "A Conceptual Model for Public Health Research." PAHO *Bulletin* 22:60–71.

Frenk, Julio, Tomas Frejka, José Luis Bobadilla, Claudio Stern, Jaime Sepúlveda, and Marco José. 1989. "The Epidemiological Transition in Latin América." In IUSSP (International Union for the Scientific Study of Population), *International Population Conference*, New Delhi. Liège 1989.

Frenk, Julio, Hector Hernández-Llamas, and Lourdes Alvarez-Klein. 1980. "El mercado de trabajo médico: II. Evolución histórica en México." *Gaceta Médica de México* 116:20–21 and 57–60.

Gómez-de-Léon, José, Julio Frenk, 1992. *Population and Health Challenges in Mexico on the Eve of the 21st Century*. Unpublished.

Hernández-Laos, Enrique. 1984. "La desigualdad regional en México (1900–1980)." In Rolando Cordera and Carlos Tello, eds., *La desigualdad en México*. México, D.F.: Siglo Veintiuno.

Jones, G. W. 1975. "Population Growth and Health and Family Planning." In W. C. Robinson, ed., *Population and Development Planning*. New York: Population Council.

Litvak, Jorge, L. Ruiz, Helena E. Restrepo, and Alison McAlister. 1987. "El problema creciente de las enfermedades no transmisibles, un desafío para los países de las Américas." *Boletín de la Oficina Sanitaria Panamericana* 103:433–449.

López-Gallardo, Juan 1984. "La distribución del ingreso en México: Estructura y evolución." In R. Cordera and C. Tello, eds., *La desigualdad en México*. México, D.F.: Siglo Veintiuno.

México, Dirección General de Estadística. 1973. "Computer Data on Deaths for 1970." México, D. F.: Instituto Nacional de Estadística, Geografía e Informática.

———. 1984. "Computer Data on Deaths for 1980." México, D. F.: Instituto Nacional de Estadística, Geografía e Informática.

———. 1988. "Computer Data on Deaths for 1985." México, D. F.: Instituto Nacional de Estadística, Geografía e Informática.

México, Dirección General de Epidemiología. 1988. *Encuesta Nacional de Salud: Resultados nacionales*. México, D. F.: Secretaría de Salud.

———. 1989. *Paludismo y otras enfermedades transmitidas por vector*. México, D. F.: Secretaría de Salud.

México, Dirección General de Planificación Familiar. 1989. *Encuesta Nacional de Fecundidad y Salud 1987*. Computer tapes. México, D. F.

México, Instituto Mexicano del Seguro Social. 1986. "Computer data on hospital discharges by cause and age groups." México, D. F.

México, INEGI (Instituto Nacional de Estadística, Geografía e Informática). 1980. *Incidencia de la mortalidád en los Estados Unidos Mexicanos*. México, D. F.: Secretaría de Programación y Presupuesto.

———. 1984. *Agenda Estadística*. México, D. F.: Secretaría de Programación y Presupuesto.

———. 1986. *Estadisticas Históricas de México*. México, D. F.: Secretaría de Programación y Presupuesto.

———. 1992. *Perfil Sociodemografico. XI Censo General de Población y Vivienda*.México, D. F.: INEGI.

México, INEGI y CONAPO (Instituto Nacional de Estadística, Geografía e Informática y Consejo Nacional de Población). 1985. *Proyecciones de la población de México y de las Entidades Federatives: 1980–2010*. México, D. F.: Secretaría de Programación y Presupuesto.

México, Secretaría de Programación y Presupuesto y Secretaría de Salubridad y Asistencia. 1984. *Boletín de Información Estadística No. 1*. México, D. F.

México, Secretaría de Salubridad y Asistencia. 1946. *Anuario Estadística de Salubridad y Asistencia*. México, D. F.: Secretaría de Salubridad y Asistencia.

México, Secretaría de Salud. 1987. *Anuario Estadístico 1987*. México, D. F.: Secretaría de Salud.

Nuñez, Leopoldo, and Lorenzo Moreno. 1986. *Proyecciones de la población urbana y rural, 1980–2010*. México, D. F.: Asociación Mexicana de Demografía Médica.

Omran, Abdel. 1971. "The Epidemiologic Transition: A Theory of the Epidemiology of Population Change." *Milbank Memorial Fund Quarterly* 49:509–38.

Omran A. R. 1983. "The Epidemiologic Transition Theory: A Preliminary Update." *Journal of Tropical Pediatrics* 29:305–16.

Soberón, Guillermo, Jesus Kumate, and José Laguna. 1988. *La salud en México: Testimonio* Vol. 1, *Problemas y programas de salud*. México, D. F.: Fondo de Cultura Económica.

Trejo, Saúl. 1988. *Empleo para todos: El reto y los caminos*. México, D. F.: Fondo de Cultura Económica.

United Nations. 1986. *World Population Prospects*. Population Studies No. 98. New York: United Nations.

———. 1989a. *Case Study in Population Policy: Mexico*. New York.

———. 1989b. *World Population Prospects, 1988*. New York.

Wildavsky, Aaron. 1977. "Doing Better and Feeling Worse: The Political Pathology of Health Policy." In *Doing Better and Feeling Worse: Health in the United States*. Proceedings of the American Academy of Arts and Sciences, 106, no. 1. Boston, Mass.

Wilkie, James W. 1978. *La Revolución Mexicana: Gasto federal y cambio social*. México, D. F.: Fondo de Cultura Económica.

World Bank. 1992. *World Development Report 1992: Development and the Environment*. Washington, D.C.

Source: Dean T. Jamison, W. Henry Mosley, Anthony R. Measham, and Jose Luis Bobadilla (eds.). *Disease Control Priorities in Developing Countries*. New York: Oxford University Press for the World Bank. 1993.